

CHAPTER VII. AUXILIARY SEA ICE OBSERVATIONS

1.1 VALUE OF AUXILIARY OBSERVATIONS

Although in recent years remotely sensed data has come to play a major role in sea ice analysis, it is not yet possible to compile a complete and accurate picture of sea ice conditions from this data source alone. Auxiliary sea ice observations play a major role in confirming remotely sensed ice information or providing important corrections to the overall picture of ice conditions.

The most important auxiliary sea ice observation is the location of the ice edge. Its value reflects both the importance of the ice edge location in general and the difficulty of accurately locating the ice edge with remotely sensed data. It is also useful to provide a description of the ice edge in terms of indications of freezing or thawing, wind-driven advance or retreat, and compactness or diffuseness.

Other important auxiliary information includes the location of the icebergs, floebergs, ice islands, old ice, ridging and hummocking. These ice features are poorly monitored by remote sensing techniques but are very important aspects of the ice cover.

Another valuable aspect of sea ice that can be reported from all locations within the ice edge is ice concentration. Because of ambiguities that often arise between concentration and albedo, particularly on data with low spatial resolution, information confirming or correcting ice concentration is always valuable to sea ice analysts.

1.2 TIMELINESS AND LOCATION OF AUXILIARY OBSERVATIONS

Although auxiliary observations are an important aspect of ice analysis, their usefulness depends greatly on two features: they must be timely and they must contain accurate location information. Timeliness is particularly important in areas where conditions may change quickly. For instance, it does the ice analyst little good to learn that the ice edge was advancing at 3 kt four days ago. Accurate location information is particularly important when reporting the ice edge because, as has been described earlier, the remotely sensed imagery often does not accurately locate the ice edge. This makes auxiliary observations very useful.

1.3 SOURCES OF AUXILIARY OBSERVATIONS

1.3.1 Shore Station Ice Reports. Obviously, shore station reports are highly local in nature. Unless the observer has access to enhanced elevations, only ice conditions within a short distance from shore can be reported. However limited the extent of these observations, the ice analyst can at least be certain of their location which, under some circumstances, can be of great value. The ice analyst must keep in mind that a shore station observer may be unaware of leads and other features just a few km away from his station. In order to make some judgement about a shore observer's report, it would be useful for the analyst to have some idea of the distance at which ice conditions can be seen from each station. Shore station reports from the following countries are currently utilized:

<u>Source of Data</u>	<u>Area Covered</u>
Argentina	Antarctica
Denmark	Baltic
Denmark	Greenland
Fed. Rep. Germany	Baltic
Finland	Baltic
German Dem. Rep.	Baltic
Norway	Baltic
Norway	Northern Islands
Poland	Baltic
Sweden	Baltic
U.S.S.R.	Baltic
United Kingdom	Antarctica
United States	Antarctica
United States	Alaska

1.3.2 Ship Ice Reports. Ice reports from ships can have great value to the ice analyst since the shipboard proximity to the ice and the motions of the ship allows the ice observer to make an accurate estimate of ice form and thickness and a reasonably accurate estimate of ice concentration. Recent improvements in navigational systems have greatly improved the locational accuracy of ship ice reports so that it should be possible to make precise comparisons with satellite-derived

data. Because of the value of ship ice reports, a special computer program at Fleet Numerical Oceanography Center scans for ice data among the weather reports gathered by the International Ship Weather Reporting System. These ice reports are then transmitted to ice analysts at the Joint Ice Center at Suitland, Maryland.

1.3.2.1 Arctic Ice Ship Reports are obtained from the following sources: U.S. Coast Guard ice breakers, Military Sealift Command vessels, NOAA research ships, merchant and fishing vessels.

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1.3.3 Aircraft Observations. Aircraft reports have great value to the ice analyst because of the observer's ability to provide ice reports from a large area and, in some cases, from locations specifically requested by the ice analyst. However, it is not always possible for the aircraft ice observer to make as detailed observations as the ship observer. It is possible that errors regarding freezing conditions and other aspects of the ice might be made. As with ship reports, the value of aircraft reports depends a great deal on the ability of the aircraft's navigational system to provide accurate locations for the ice observations.

1.3.3.1 Arctic Aircraft Ice Observations are available from the following sources:

(1) U.S. Navy dedicated sea ice reconnaissance flights. The following observation techniques are available: visual, radar, radiometer (sea surface radiation thermometer) and laser profilometer.

(2) U.S. Navy ice observer flights of opportunity. Observation techniques available are visual and radar.

(3) U.S. Coast Guard International Ice Patrol (visual and radar observations).

(4) Private industry (primarily Alaska sector)(visual observations).

(5) U.S. Navy Patrol aircraft (radar observations).

(6) Canadian Ice Center Patrol aircraft (observations by side-looking airborne radar and visual observation).

- (7) Denmark Ice Patrol aircraft (visual and radar observations).
- (8) Norwegian Patrol aircraft (visual and radar observations).
- (9) Japanese Patrol aircraft (visual and radar observations).

1.3.3.2 Antarctic Aircraft Ice Observations are available from the following sources:

- (1) U.S. Navy dedicated ice reconnaissance flights (visual and radar observations).
- (2) U.S. Navy ice observer flights of opportunity (visual and radar observations).
- (3) U.S. Coast Guard flights (visual observations).
- (4) United Kingdom (visual observations).